1   CLAIMS

2

3   What is claimed is:

4

5   1. A display system for multimedia content data comprising

6   Mathematical Markup Language (MathML) data, said system

7   comprising:

8

9   a display medium having a plurality of display lines for rendering

10   multimedia content data thereon;

11

12   a processor associated with said display medium and configured to:

13

14   receive said multimedia content data comprising textual, MathML, and

15   external file indicia data;

16

17   parse said received multimedia content data to derive said textual,

18   MathML and external file indicia data;

19

1   categorize said textual, MathML and file data according to a data

2   type; wherein said textual data is defined as a TEXT data type, said

3   MathML data is defined as a MATHML data type and said external

4   file indicia data is defined as a FILE data type;

5

6   store said derived and categorized textual, MathML and external file

7   indicia data as a tree having a root node and a plurality of offspring

8   nodes that define left and right subtrees, said root node and said

9   offspring nodes each having one of said derived textual, MathML and

10   external file indicia data and respective data type association;

11

12   define a traverse procedure that includes:

13

14   visiting a node of said tree,

15

16   determining the data type of said node;

17

18   displaying said node data in accordance with said data type,

19   wherein:

20

1   if the data type is TEXT: create a text object having said

2   textual node data and locate a display line to display said text

3   object in accordance with predetermined formatting

4   conventions,

5

6   if the data type is FILE: create a file object having said external

7   file indicia node data and locate a display line to load and

8   display said file object in-line with previously rendered text

9   and in accordance with predetermined formatting conventions,

10

11   if the data type is MATHML, create a MathML data object

12   having said stored MathML node data and locate a display line

13   to display said MathML data object in-line with previously

14   rendered text and in accordance with predetermined formatting

15   conventions,

16

17   applying said traverse procedure upon the left subtree of said

18   visited node;

19

1   applying said traverse procedure upon the right subtree of said

2   visited node; and

3

4   applying said traverse procedure upon said root node such that

5   said root node is the first visited node.

6

7   2. A system as in claim 1 wherein said processor further categorizes said

8   MathML data as MATHML COMPOSITE and MATHML

9   TERMINAL data types;

10

11   stores said categorized MathML data as a MathML tree having a root

12   node and a plurality of offspring nodes that define left and right

13   subtrees of said MathML tree, said root node and said offspring nodes

14   of said MathML tree each having one of said derived MathML data

15   and respective data type association;

16

17   defines a second traverse procedure that includes:

18

19   visiting a node of said MathML tree,

20

1   determining the MathML data type of said MathML tree node,

2

3   displaying said MathML tree node data in accordance with said

4   data type, wherein:

5

6   if the data type is MATHML COMPOSITE: create a

7   MathML data object having said stored MathML

8   composite node data and locate a display line to

9   display said MathML data object in-line with

10   previously rendered text and in accordance with

11   predetermined formatting conventions, and,

12

13   if the data type is MATHML TERMINAL: create a

14   MathML data object having said stored MathML node

15   terminal node data and locate a display line to display

16   said MathML data object in-line with previously

17   rendered text and in accordance with predetermined

18   formatting conventions,

19

1   applying said second traverse procedure upon the left sub-

2   MathML tree of said visited MathML tree node;

3

4   applying said second traverse procedure upon the right sub-

5   MathML tree of said visited MathML tree node; and

6

7   applying said second traverse procedure upon said root node of

8   said MathML tree such that said root node is the first visited

9   node of the MathML tree.

10

11   3. The system as in claim 1 or 2 wherein said multimedia content data

12   comprises Markup Language data.

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14   4. The system as in claim 3 wherein said Markup Language data

15   comprises Extensible Markup Language (XML) data.

16

17   5. The system as in claim 1 or 2 wherein said external file indicia data

18   comprises information associated with data files comprising graphics,

19   video, animation, other displayable assets or a combination thereof.

20

1   6. The system as in claim 4 wherein said data files are Macromedia or

2   Flash-compatible files.

3

4   7. A method of displaying multimedia content data comprising

5   Mathematical Markup Language (MathML) data, said method

6   comprising:

7

8   providing a display medium having a plurality of display lines for

9   rendering multimedia content data thereon;

10

11   receiving said multimedia content data comprising textual, MathML,

12   and external file indicia data;

13

14   parsing said received multimedia content data to derive said textual,

15   MathML and external file indicia data;

16

17   categorizing said textual, MathML and file data according to a data

18   type; wherein said textual data is defined as a TEXT data type, said

19   MathML data is defined as a MATHML data type and said external

20   file indicia data is defined as a FILE data type;

1

2   storing said derived and categorized textual, MathML and external

3   file indicia data as a tree having a root node and a plurality of offspring

4   nodes that define left and right subtrees, said root node and said

5   offspring nodes each having one of said derived textual, MathML and

6   external file indicia data and respective data type association;

7

8   defining a traverse procedure that includes:

9

10   visiting a node of said tree,

11

12   determining the data type of said node;

13

14   displaying said node data in accordance with said data type,

15   wherein:

16

17   if the data type is TEXT: create a text object having said

18   textual node data and locate a display line to display said text

19   object in accordance with predetermined formatting

20   conventions,

1

2   if the data type is FILE: create a file object having said external

3   file node data and locate a display line to load and display said

4   file object in-line with previously rendered text and in

5   accordance with predetermined formatting conventions,

6

7   if the data type is MATHML, create a MathML data object

8   having said stored MathML node data and locate a display line

9   to display said MathML data object in-line with previously

10   rendered text and in accordance with predetermined formatting

11   conventions,

12

13   applying said traverse procedure upon the left subtree of said

14   visited node;

15

16   applying said traverse procedure upon the right subtree of said

17   visited node; and

18

19   applying said traverse procedure upon said root node such that

20   said root node is the first visited node.

1

2 8. The method as in claim 7 wherein said method further comprises

3   categorizing said MathML data as MATHML COMPOSITE and

4   MATHML TERMINAL data types;

5

6   storing said categorized MathML data as a MathML tree having a root

7   node and a plurality of offspring nodes that define left and right

8   subtrees of said MathML tree, said root node and said offspring nodes

9   of said MathML tree each having one of said derived MathML data

10   and respective data type association;

11

12   defining a second traverse procedure that includes:

13

14   visiting a node of said MathML tree,

15

16   determining the MathML data type of said MathML tree node,

17

18   displaying said MathML tree node data in accordance with said

19   data type, wherein:

20

1   if the data type is MATHML COMPOSITE: create a

2   MathML data object having said stored MathML

3   composite node data and locate a display line to

4   display said MathML data object in-line with

5   previously rendered text and in accordance with

6   predetermined formatting conventions, and,

7

8   if the data type is MATHML TERMINAL: create a

9   MathML data object having said stored MathML node

10   terminal node data and locate a display line to display

11   said MathML data object in-line with previously

12   rendered text and in accordance with predetermined

13   formatting conventions,

14

15   applying said second traverse procedure upon the left sub-

16   MathML tree of said visited MathML tree node;

17

18   applying said second traverse procedure upon the right sub-

19   MathML tree of said visited MathML tree node; and

20

1   applying said second traverse procedure upon said root node of

2   said MathML tree such that said root node is the first visited

3   node of the MathML tree.

4

5   9. The method as in claim 7 or 8 wherein said multimedia content data

6   comprises Markup Language data.

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8   10. The method as in claim 9 wherein said Markup Language data

9   comprises Extensible Markup Language (XML) data.

10

11   11. The method as in claim 7 or 8 wherein said external file indicia data

12   comprises information associated with data files comprising graphics,

13   video, animation, other displayable objects or a combination thereof.

14

15   12. The method as in claim 11 wherein said data files are Macromedia

16   Flash or Flash-compatible files.

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1   13. A user interface for presenting question and answer multimedia data

2   comprising mathematical MathML content, said system comprising:

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4   a processor configured to:

5

6   receive said multimedia data comprising textual, MathML and external

7   file data;

8

9   parse said received multimedia data to derive said textual, MathML

10   and external file data;

11

12   generate question content and associated answer, visual aid and

13   descriptive solution content based on said derived textual, MathML

14   and external file data;

15

16   display first, second, third and fourth display containers on said

17   display device, said first display container including a presentation

18   area for displaying said question content; said second display container

19   including a presentation area for displaying said answer content; said

20   third display container including a presentation area for displaying said

1   visual aid content; said fourth display container including a

2   presentation area for displaying said descriptive solution content; and

3

4   wherein for each of said first, second, third and fourth display

5   containers said MathML and external file data of said container

6   content are displayed in-line with said textual data of said container

7   content.

8

9   14. The user interface as in claim 13 wherein said external file data

10   includes graphics, video, animation, other displayable objects or any

11   combination thereof.

12

13   15. The user interface as in claim 13 or 14 wherein said multimedia data

14   comprises Markup Language data.

15

16   16. The user interface as in claim 15 wherein said Markup Language data

17   comprises Extensible Markup Language (XML) data.

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